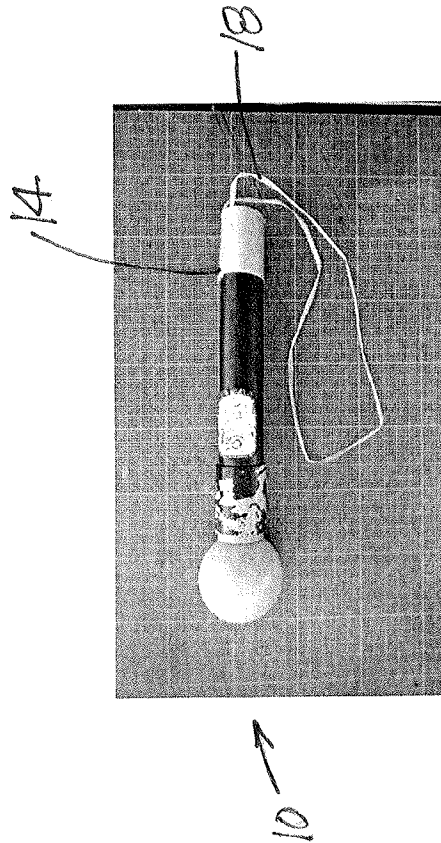


EXHIBIT 7

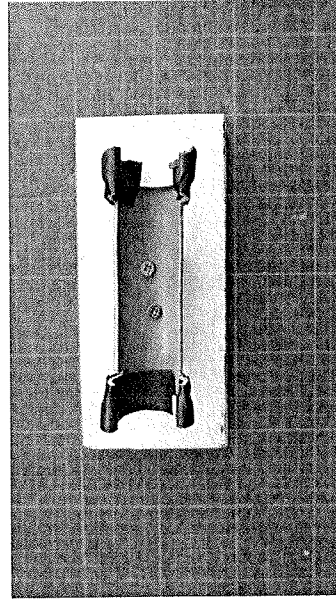
1/7

Patent #1 : Hydrocommand
Length around 30 /35 cm ideally (can be longer or smaller)



Autonomous hydrocommand

FIG. 1A



Can have a stand /
caddy or charging base fixation /
wall fixation

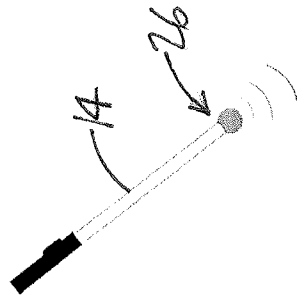
FIG. 1B

FIG. 2

Hydrocommand main targeted function



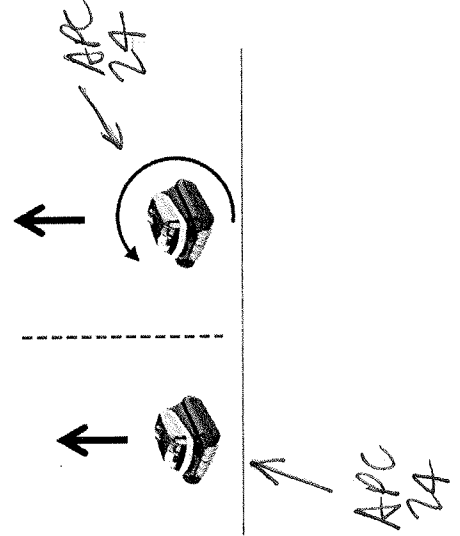
With the hydrocommand, the user needs to plunge the command under water surfacet to make the signal understandable by the robot.



Two kinds of specific orders :

Short press = easy lift

Long press = orientable easy lift.



14
26
SP

D

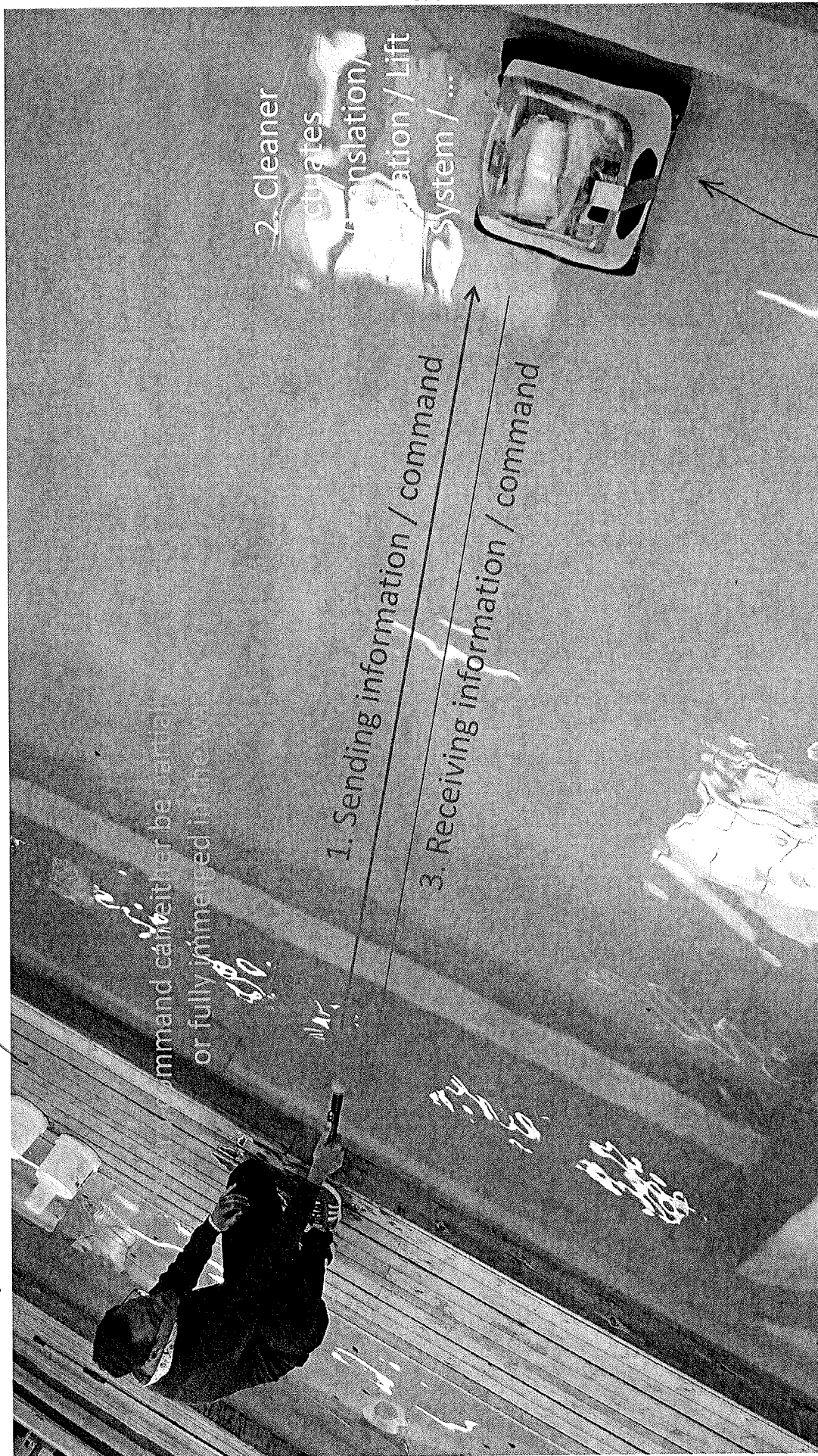
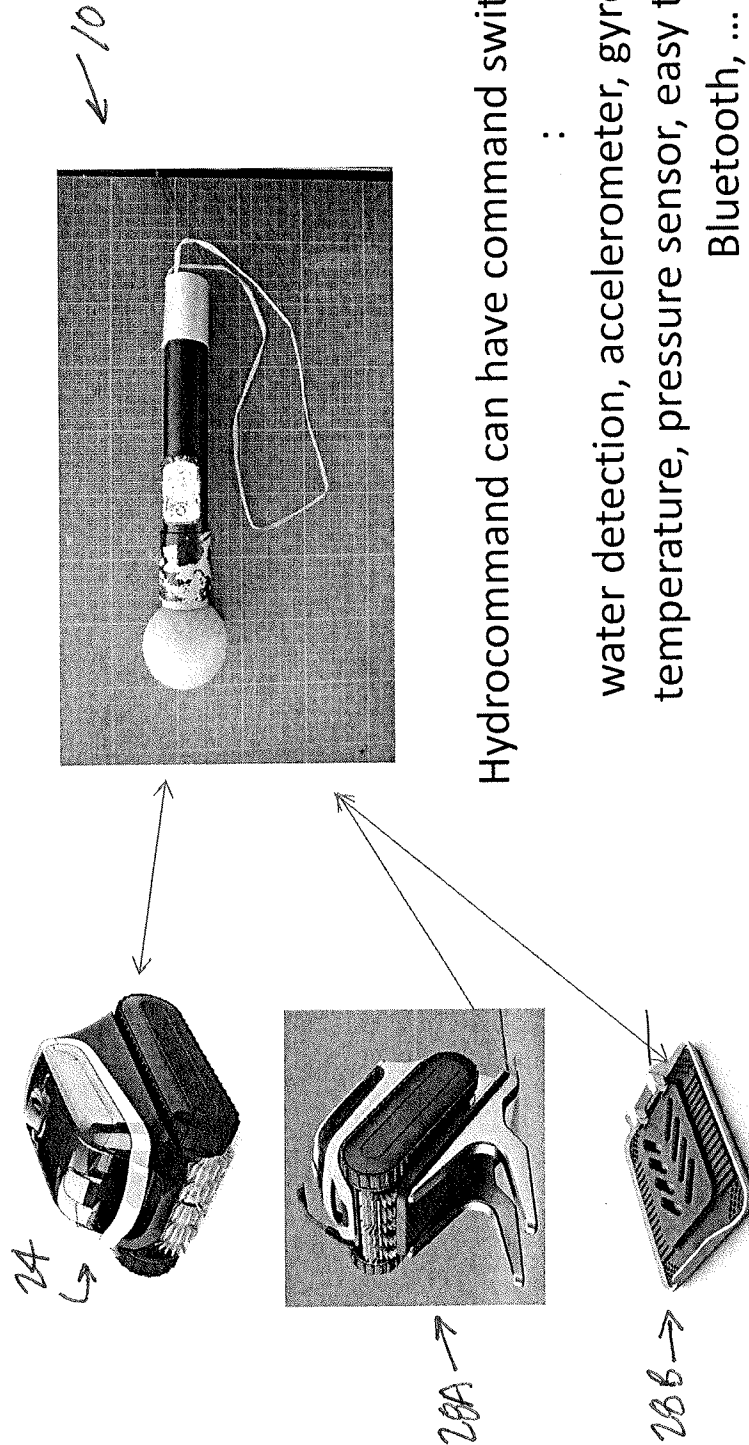


FIG. 3

Patent #1 : Hydrocommand

Hydrocommand can communicate (sending and/or receiving data) with :
cleaner / charging base / App / control box



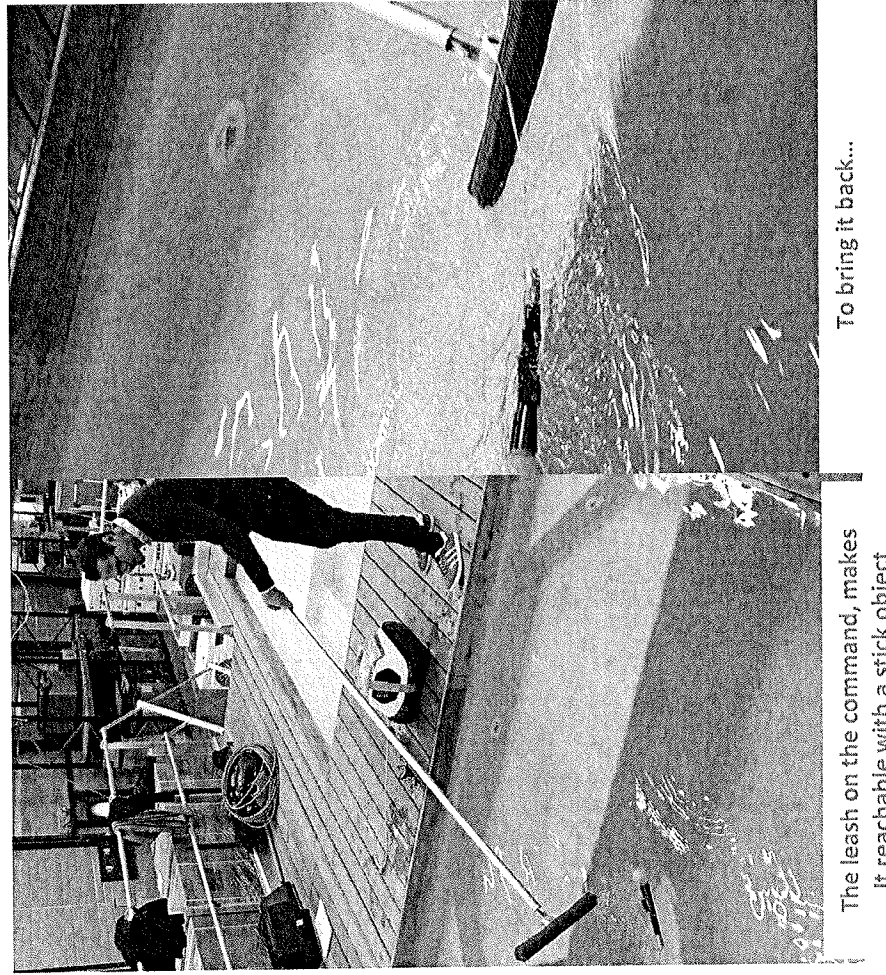
Hydrocommand can have command switch(es), and/or sensors like

:

water detection, accelerometer, gyroscope, compass, GPS,
temperature, pressure sensor, easy to find functions, WiFi,
Bluetooth, ...

FIG. 4

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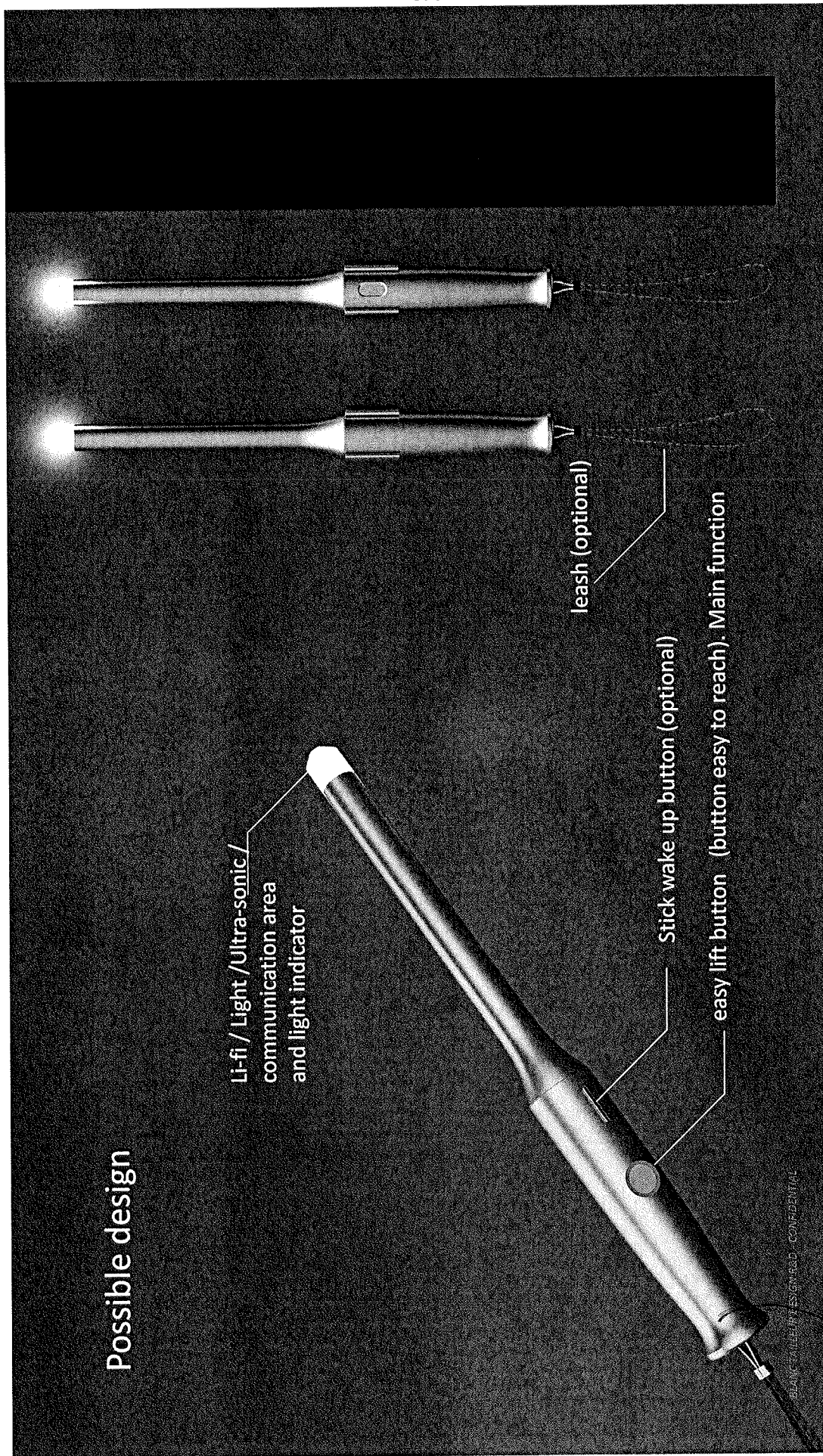
To bring it back...

The leash on the command, makes
it reachable with a stick object

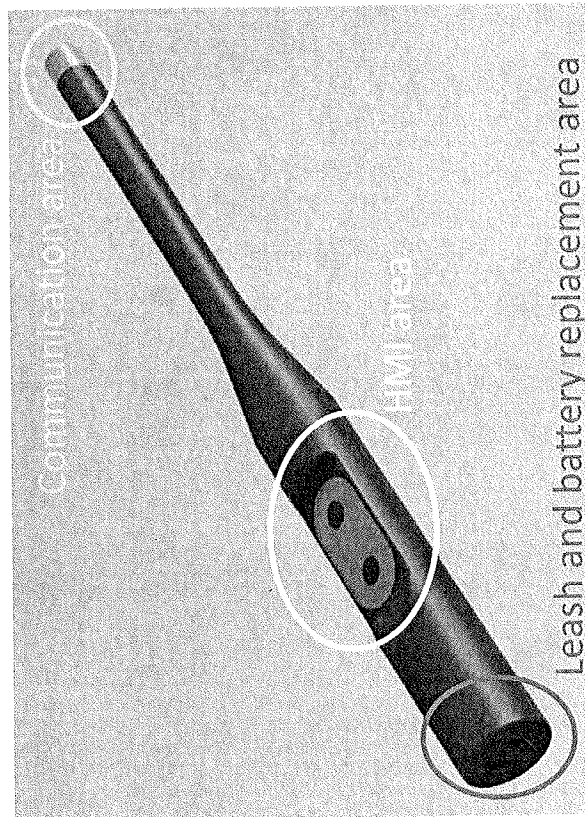
Hydrocommand can:

1. float ideally to be able to be caught at water surface
2. Have a leash or other part/protrusion to prevent from falling off the arm
3. Have a leash or other part/protrusion to be able to grab it more easily by hand or with any kind of swipe, stick, broom, pool net, ...

FIG. 5



7/7

Possible technology:

Possible light user feedback

Body made of 1 or 2 parts

switches

batteries

FIG. 7

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0S0457-1190092
		Application Number	
Title of Invention	DEVICES, SYSTEMS, AND METHODS FOR UNDERWATER COMMUNICATION WITH EQUIPMENT SUCH AS AUTOMATIC SWIMMING POOL CLEANERS		
<p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p>			

Secrecy Order 37 CFR 5.2:

<input type="checkbox"/>	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1				<input type="button" value="Remove"/>	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>		
Residence Information (Select One) <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service						
City	<input type="text"/>	State/Province	<input type="text"/>	Country of Residence	<input type="text"/>	
Mailing Address of Inventor:						
Address 1		<input type="text"/>				
Address 2		<input type="text"/>				
City	<input type="text"/>	State/Province	<input type="text"/>	<input type="text"/>		
Postal Code	<input type="text"/>	Country	<input type="text"/>	<input type="text"/>		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. <input type="button" value="Add"/>						

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
<input type="checkbox"/> An Address is being provided for the correspondence information of this application.			
Customer Number	23370		
Email Address	pefiling@kilpatricktownsend.com		<input type="button" value="Add Email"/> <input type="button" value="Remove Email"/>

Application Information:

Title of the Invention	DEVICES, SYSTEMS, AND METHODS FOR UNDERWATER COMMUNICATION WITH EQUIPMENT SUCH AS AUTOMATIC SWIMMING POOL CLEANERS		
Attorney Docket Number	0S0457-1190092	Small Entity Status Claimed	<input type="checkbox"/>
Application Type	Provisional <input type="text"/>		
Subject Matter	Utility <input type="text"/>		
Total Number of Drawing Sheets (if any)	7	Suggested Figure for Publication (if any)	<input type="text"/>

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0S0457-1190092
		Application Number	
Title of Invention	DEVICES, SYSTEMS, AND METHODS FOR UNDERWATER COMMUNICATION WITH EQUIPMENT SUCH AS AUTOMATIC SWIMMING POOL CLEANERS		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not be** the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	<input checked="" type="radio"/> Customer Number	US Patent Practitioner	<input type="radio"/> Limited Recognition (37 CFR 11.9)
Customer Number	23370		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status			<input type="button" value="Remove"/>
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0S0457-1190092
		Application Number	
Title of Invention	DEVICES, SYSTEMS, AND METHODS FOR UNDERWATER COMMUNICATION WITH EQUIPMENT SUCH AS AUTOMATIC SWIMMING POOL CLEANERS		

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0S0457-1190092
		Application Number	
Title of Invention	DEVICES, SYSTEMS, AND METHODS FOR UNDERWATER COMMUNICATION WITH EQUIPMENT SUCH AS AUTOMATIC SWIMMING POOL CLEANERS		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0S0457-1190092
		Application Number	
Title of Invention	DEVICES, SYSTEMS, AND METHODS FOR UNDERWATER COMMUNICATION WITH EQUIPMENT SUCH AS AUTOMATIC SWIMMING POOL CLEANERS		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant	1	Remove
<p>If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.</p> <p style="text-align: right;">Clear</p>		
Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
<input type="radio"/> Person to whom the inventor is obligated to assign.		<input type="radio"/> Person who shows sufficient proprietary interest
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		
Name of the Deceased or Legally Incapacitated Inventor: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		
If the Applicant is an Organization check here. <input checked="" type="checkbox"/>		
Organization Name	ZODIAC POOL CARE EUROPE	
Mailing Address Information For Applicant:		
Address 1	2-4 Rue Edison	
Address 2	Parc d'Activité du Chêne	
City	Bron	State/Province
Country	FR	Postal Code
Phone Number		Fax Number
Email Address		
Additional Applicant Data may be generated within this form by selecting the Add button. <div style="float: right;">Add</div>		

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0S0457-1190092
		Application Number	
Title of Invention	DEVICES, SYSTEMS, AND METHODS FOR UNDERWATER COMMUNICATION WITH EQUIPMENT SUCH AS AUTOMATIC SWIMMING POOL CLEANERS		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				<input type="button" value="Remove"/>
If the Assignee or Non-Applicant Assignee is an Organization check here.				<input type="checkbox"/>
Prefix	Given Name	Middle Name	Family Name	Suffix
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1		<input type="text"/>		
Address 2		<input type="text"/>		
City	<input type="text"/>	State/Province	<input type="text"/>	
Country ⁱ	<input type="text"/>	Postal Code	<input type="text"/>	
Phone Number	<input type="text"/>	Fax Number	<input type="text"/>	
Email Address	<input type="text"/>			
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				<input type="button" value="Add"/>

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Dean W. Russell/		Date (YYYY-MM-DD)	2020-08-06
First Name	Dean	Last Name	Russell	Registration Number
Additional Signature may be generated within this form by selecting the Add button.				<input type="button" value="Add"/>

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0S0457-1190092
		Application Number	
Title of Invention	DEVICES, SYSTEMS, AND METHODS FOR UNDERWATER COMMUNICATION WITH EQUIPMENT SUCH AS AUTOMATIC SWIMMING POOL CLEANERS		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

**DEVICES, SYSTEMS, AND METHODS FOR UNDERWATER
COMMUNICATION WITH EQUIPMENT SUCH AS
AUTOMATIC SWIMMING POOL CLEANERS**

FIELD OF THE INVENTION

This invention relates to communicating with equipment operating underwater and more particularly, although not necessarily exclusively, to devices, systems, and methods for wirelessly communicating underwater with autonomous vehicles such as automatic pool cleaners (“APCs”) configured to operate in swimming pools or spas.

BACKGROUND OF THE INVENTION

Commonly-owned U.S. Patent No. 9,250,626 to Michelin describes an exemplary apparatus (often called a “robot” or a “robotic APC”) for cleaning a swimming pool. The apparatus includes wheels or other motive elements and is configured to travel autonomously within the pool. It further may be connected via cable to an “intermediate relay,” or control box, positioned near the pool. The external control box may receive signals from a wireless transmitter of a remote control device and forward control information to the cleaning apparatus through the cable. In particular, because of known difficulties in transmitting wireless radio frequency (RF) signals substantial distances through water, the control box is not positioned within the pool, nor does the wireless transmitter of the remote control device communicate directly with the underwater APC. The control box thus indeed functions as an “intermediate relay,” in that it receives control information wirelessly externally of the pool and relays it via wire to the submerged cleaner within the pool.

U.S. Patent Application Publication No. 2020/0063454 of Attar, *et al.*, discusses another robotic APC to which a control cable is connected. Consistent with conventional devices, the cleaner of the Attar application receives signals via wire from an external source. As noted in the Attar application, the cable is subject to being pulled for various reasons; although such pulling is disadvantageous in some cases, the cleaner of the Attar application describes using sensed directional pulling information to control certain movements of the cleaner.

DESCRIPTION

The present invention seeks to avoid need for any wired communication with an APC. It also strives to provide devices, systems, and methods for communicating wirelessly with such cleaners when submerged in pools. Beneficially, the devices and systems may be both hand-held and capable of having at least portions immersed in water in normal use.

Exemplary devices consistent with the present invention conceivably may wirelessly transmit and receive RF signals. Generally, however, transmission and receipt of RF signals is not preferred, at least due to the difficulty discussed above. Instead, light-based signals, such as (but not limited to) light fidelity (LiFi) signals, beneficially may be employed instead. Sound navigation and ranging (SONAR) or other types of signals alternatively may be utilized in appropriate situations.

Once communication is established between an APC and a device of the present invention, any type of information or data may be exchanged by the light-based (or other) signals. In particular, a robotic APC within a swimming pool may be signaled when a

homeowner or other pool user desires to remove the APC from the pool. The signals may instruct the APC to begin movement until it reaches any wall of the pool and then climb the wall for presentation to the user at the waterline of the pool, which in this application may be called “easy lift.” Alternatively, the APC may be instructed to turn toward the user and move within the pool until it reaches the wall closest to the user, following which it climbs the wall for presentation at the waterline (called “orientable easy lift”). In the former circumstance, the user must walk along the pool deck to retrieve the APC at the waterline, whereas in the latter circumstance, the APC presents itself for retrieval in the immediate vicinity of the user.

FIGS. 1-7 illustrate various aspects and features of an exemplary device and system of the present invention. As shown in FIG. 1A, device 10 may have an elongated structure suitable for grasping by a user. Device 10 thus itself is “autonomous,” as it may incorporate at least a wireless transceiver and a power supply within its housing 14. FIG. 1A also illustrates an optional strap or leash 18 which may be connected to housing 14 to facilitate a user’s control of device 10. FIG. 1B depicts an exemplary base 22 on which device 10 may be mounted for storage or safekeeping. Persons skilled in the art will recognize that device 10 need not necessarily be sized, shaped, or structured as illustrated in FIG. 1A, however, and that base 22 likewise is not necessary.

FIG. 2 depicts a user U in the process of communicating with APC 24 operating within water of a swimming pool SP. User U advantageously need not enter the pool SP, but rather may communicate with the APC 24 while positioned on deck D of the pool SP. In FIG. 2, user U is holding device 10 with head 26 of housing 14 underwater; by

contrast, the remainder of housing 14 need not necessarily be underwater. Head 26 may contain the light-based (or other) transmitter and receiver for communicating with APC 24.

Mentioned in FIG. 2 are two sample types of instructions that may be sent to APC 24. One type, labelled “Short press,” produces the “easy lift” result described above. A second type, labelled “Long press,” may produce the above-discussed “orientable easy lift” result. Other instructions may be sent to APC 24 in any suitable manner, however, and “long” and “short” presses are not limited to producing any particular types of instructions.

Provided by FIG. 3 is a simplified description of certain activities of device 10 and APC 24. The figure represents a situation in which APC 24 is positioned within swimming pool SP remote from any wall thereof and user U would like to retrieve the APC 24 and remove it from the pool SP. As shown, user U is kneeling on deck D of the swimming pool, holding device 10 so that head 26 can be at least partially submerged in water of the pool SP. The user U may cause device 10 to send signals to APC 24 (action 1 in FIG. 3) including, for example, instructing the APC 24 to present itself for retrieval. APC 24 may receive the signals and actuate either its “easy lift” or “orientable easy lift” systems (action 2). APC 24 additionally may transmit signals back to device 10 if appropriate (action 3). As noted in text accompanying FIG. 3, device 10 may be either partially or completely submerged in water of the pool SP.

Discussed in FIG. 4 is that at least some embodiments of device 10 could be configured to communicate not only with APC 24, but also with other components. FIG. 4 depicts communication with charging bases 28A and 28B, as examples. Communication with control boxes such as the intermediate relay of the Michelin patent also could occur, as could communication with smartphones, tablets, computers, servers, *etc.*, located either

locally to or remote from pool SP. Versions of device 10 additionally could include command switches and sensors (including but not limited to water detection sensors, accelerometers, gyroscopes, compasses, GPS, temperature sensors, pressure sensors, easy-to-find functions, WiFi switches, Bluetooth switches, *etc.*).

Further advantageous is that device 10 be buoyant in water, so that it would not normally sink if inadvertently dropped by the user U. FIG. 5 depicts buoyant device 10 floating at the waterline of pool SP. Leash 18 may function to receive an arm of a user U to reduce risk of the user U from dropping the device 10 into the pool SP. Leash 18 additionally may facilitate retrieval of device 10 using a stick or other object, also as shown in FIG. 5.

Illustrated in FIGS. 6-7 are exemplary designs of device 10. In FIG. 6, head 26 is referred to as “Li-fi/Light/Ultra-sonic communication area and light indicator,” and leash 18 is indicated as optional. Non-head portion 34 of device 10 may be configured to be easy to grasp; as shown in FIG. 6, it also may include an “easy lift” actuation button or switch and a “stick wake up button” or switch. Alternatively or additionally, device 10 may include a water detector sensing that head 26 is in contact with water and, for example, “wake up” or send a message, for example. FIG. 7 provides additional detail concerning an exemplary device 10, identifying head 26 as a “Communication area” and non-head portion 34 as including both a human-machine interface (HMI) and an area for leash 18, batteries 35, and printed circuit board (PCB) 36. FIG. 7 further mentions that body 38 of device 10 may be made in one or more parts as desired.

Exemplary concepts or combinations of features of the invention may include:

- A. A hand-held device comprising a communication region configured to operate while immersed in water.
- B. A method of communicating with equipment operating in water of a swimming pool, comprising immersing at least part of the communication device in the water and causing the communication device to emit a signal through the water to the equipment.
- C. A method according to statement B. in which the emitted signal is light based.
- D. A method according to statement C. further comprising causing the communication device to receive a return signal from the equipment through the water.
- E. A system for cleaning a swimming pool comprising (a) an automatic swimming pool cleaner configured to operate in water within the swimming pool and (b) a hand-held device comprising a communication region configured to operate while immersed in the water.

These examples are not intended to be mutually exclusive, exhaustive, or restrictive in any way, and the invention is not limited to these example embodiments but rather encompasses

all possible modifications and variations within the scope of any claims ultimately drafted and issued in connection with the invention (and their equivalents). For avoidance of doubt, any combination of features not physically impossible or expressly identified as non-combinable herein may be within the scope of the invention.

The entire contents of the Michelin patent and the Attar application are incorporated herein by this reference. Further, although applicant has described devices for use in connection with water containing vessels, persons skilled in the relevant field will recognize that the present invention may be employed in other manners. Finally, references to “pools” and “swimming pools” herein may also refer to spas or other water containing vessels used for recreation or therapy.

ABSTRACT

Devices, systems, and methods for wirelessly communicating underwater with equipment such as, but not necessarily limited to, automatic swimming pool cleaners (APCs) are detailed. Such communication avoids any need for conventional wired communication with the APCs. At least certain of the devices may be hand-held and capable of having at least portions immersed in water in normal use. The devices preferably do not use radio frequency (RF) signals to communicate with APCs, instead employing light-based or other signal types.